

FIG. 1

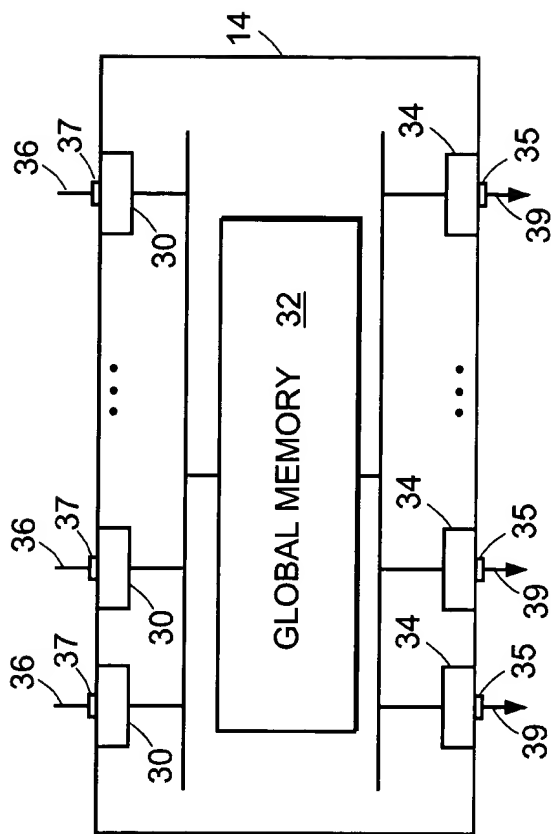


FIG. 2

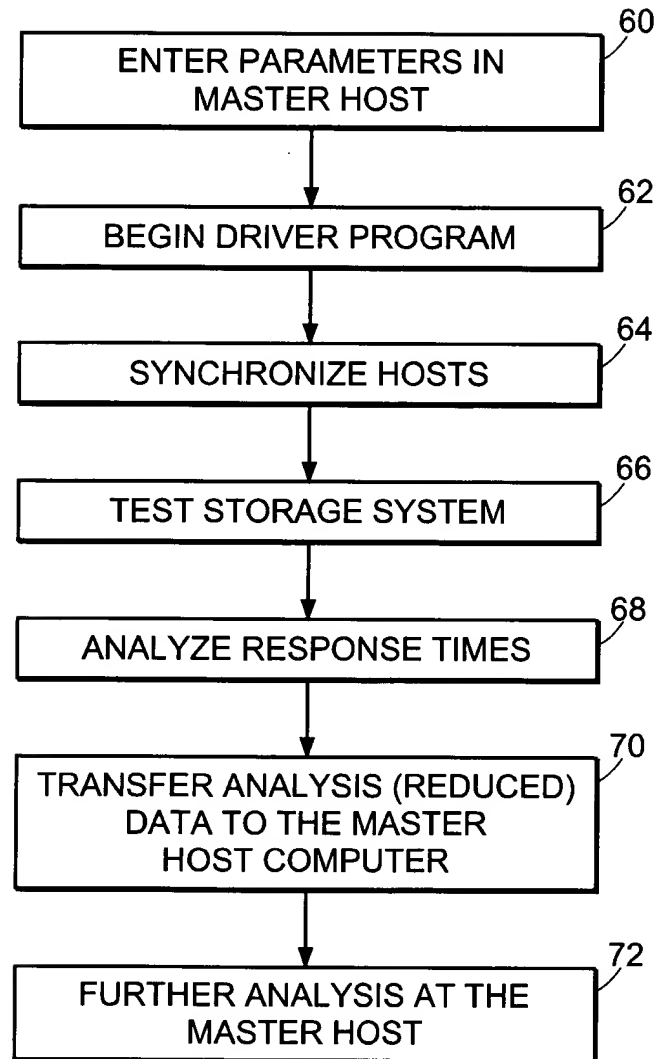


FIG. 3



FIG. 4A
FIG. 4B

FIG. 4

REQUIRED	NUMBER OF LOGICAL DISKS
	NUMBER OF "CHILD" PROCESSES TO START
	NUMBER OF CAPTURE RESPONSE TIMES
	NUMBER OF RESPONSE TIMES
	BUFFER SIZE
	OFFSET SIZE
	MAXIMUM RANGE
	TIME OF TEST
	READ/WRITE SIZE
	READ/WRITE MIX

FIG. 4A



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OPTIONAL	ID OF DEVICES BEING TESTED
	ID OF MASTER & CLIENT HOSTS
	I/O TYPE (SEQUENTIAL OR RANDOM)
	NUMBER OF I/O OPERATIONS PERFORMED TO CORRECT OFFSET
	DISPLACEMENT FROM OFFSET
	DELAY BETWEEN COMMANDS
	INITIAL BYTE OFFSET
	NUMBER OF SEEKS FOR RANDOM I/O
	DATA REDUCTION METHOD
	ICDA PERCENT HIT RATE

FIG. 4B

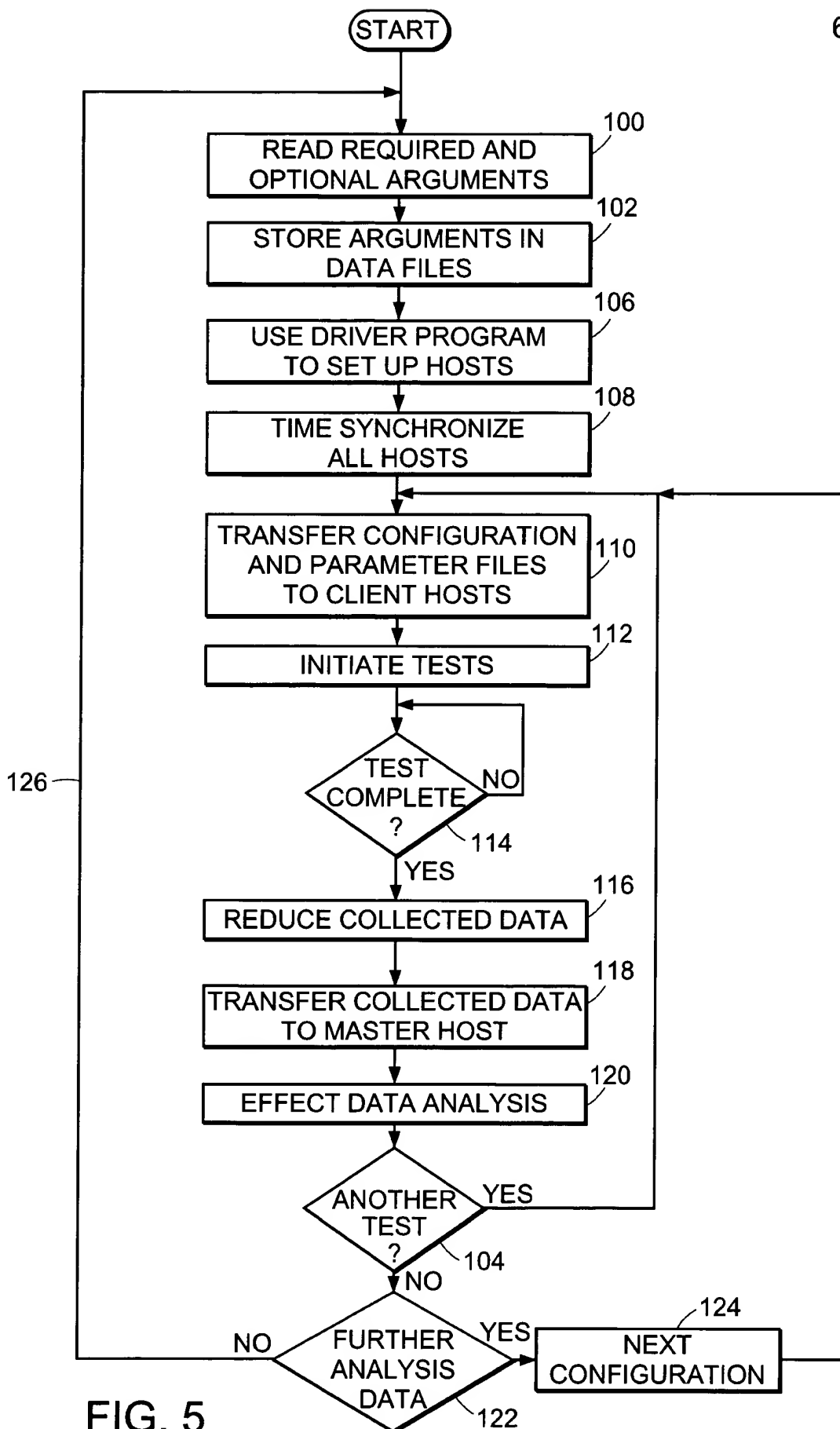


FIG. 5

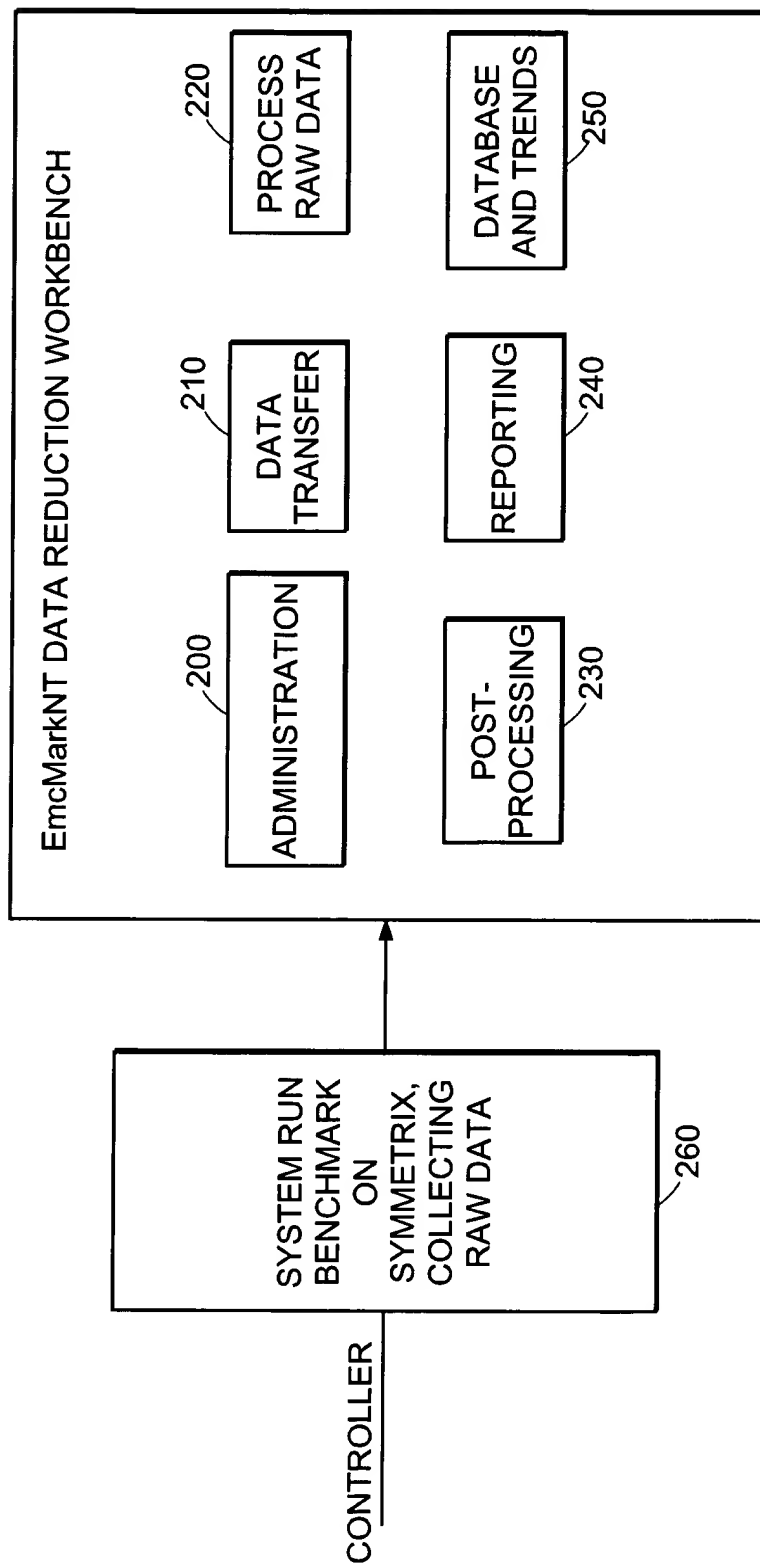


FIG. 6

EmcMarkNT DATA REDUCTION WORKBENCH FLOW

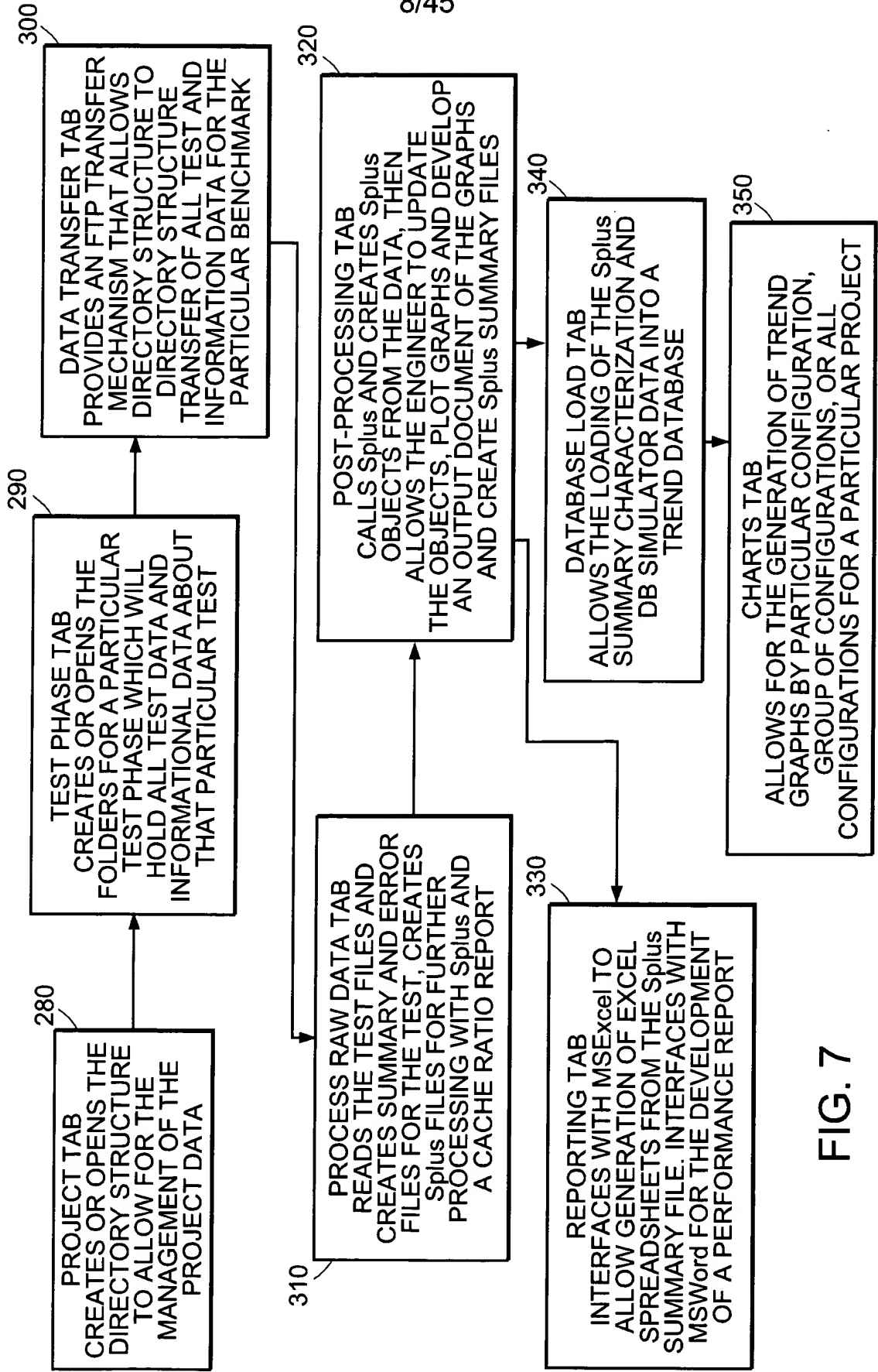
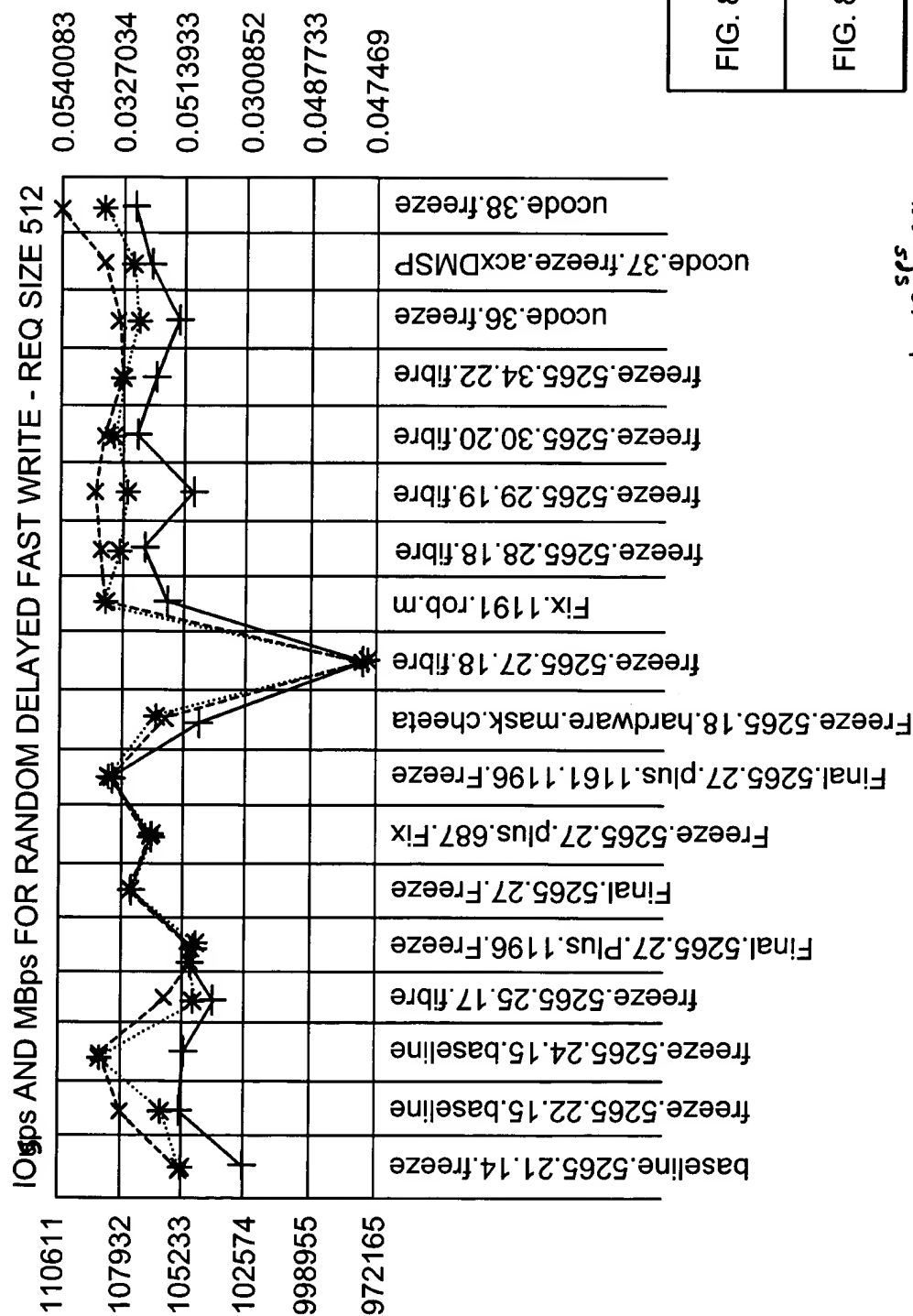


FIG. 7



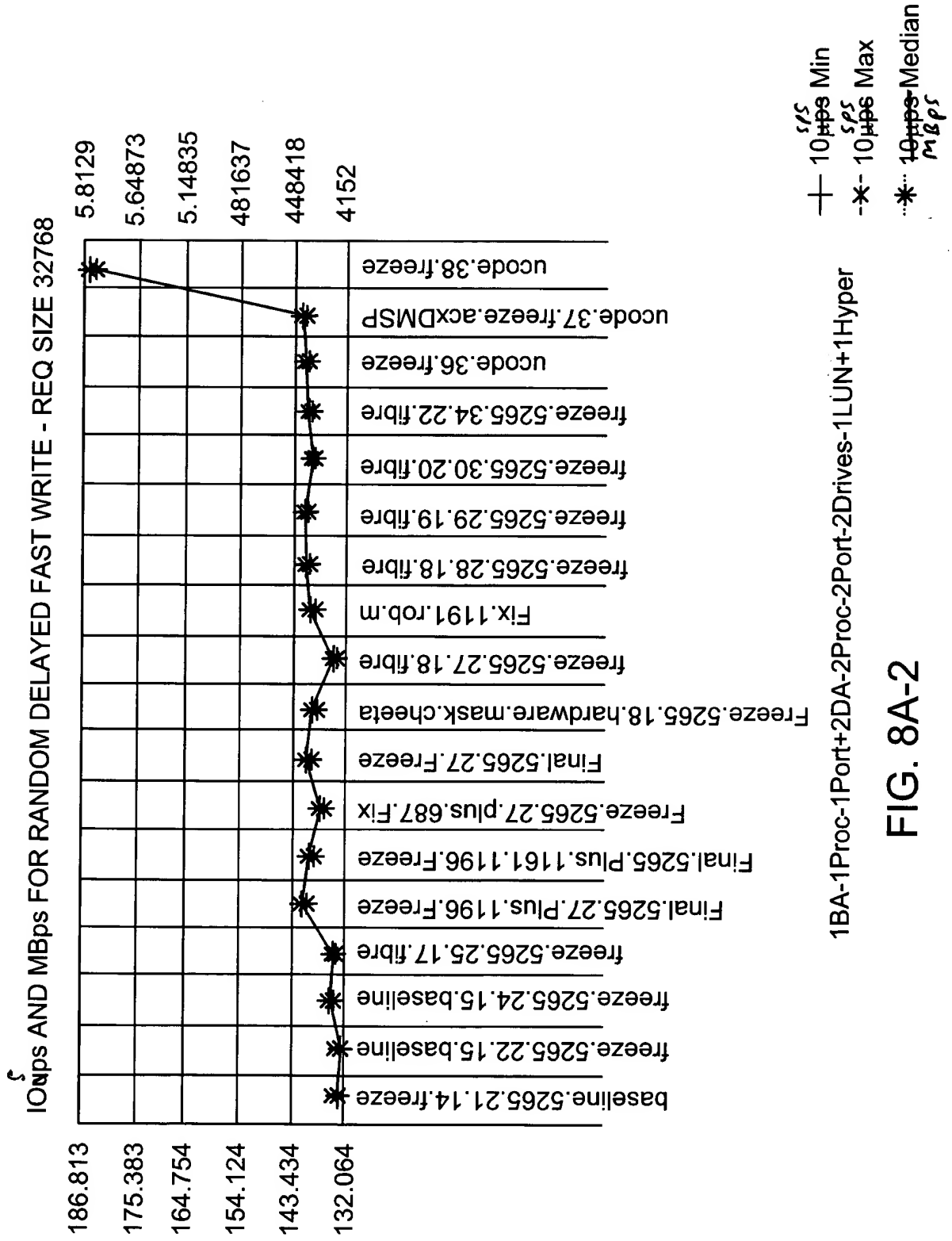
10MBps Min
 10MBps Max
 Median

1BA-1Proc-1Port+2DA-2Proc-2Port-2Drives-1LUN+1Hyper

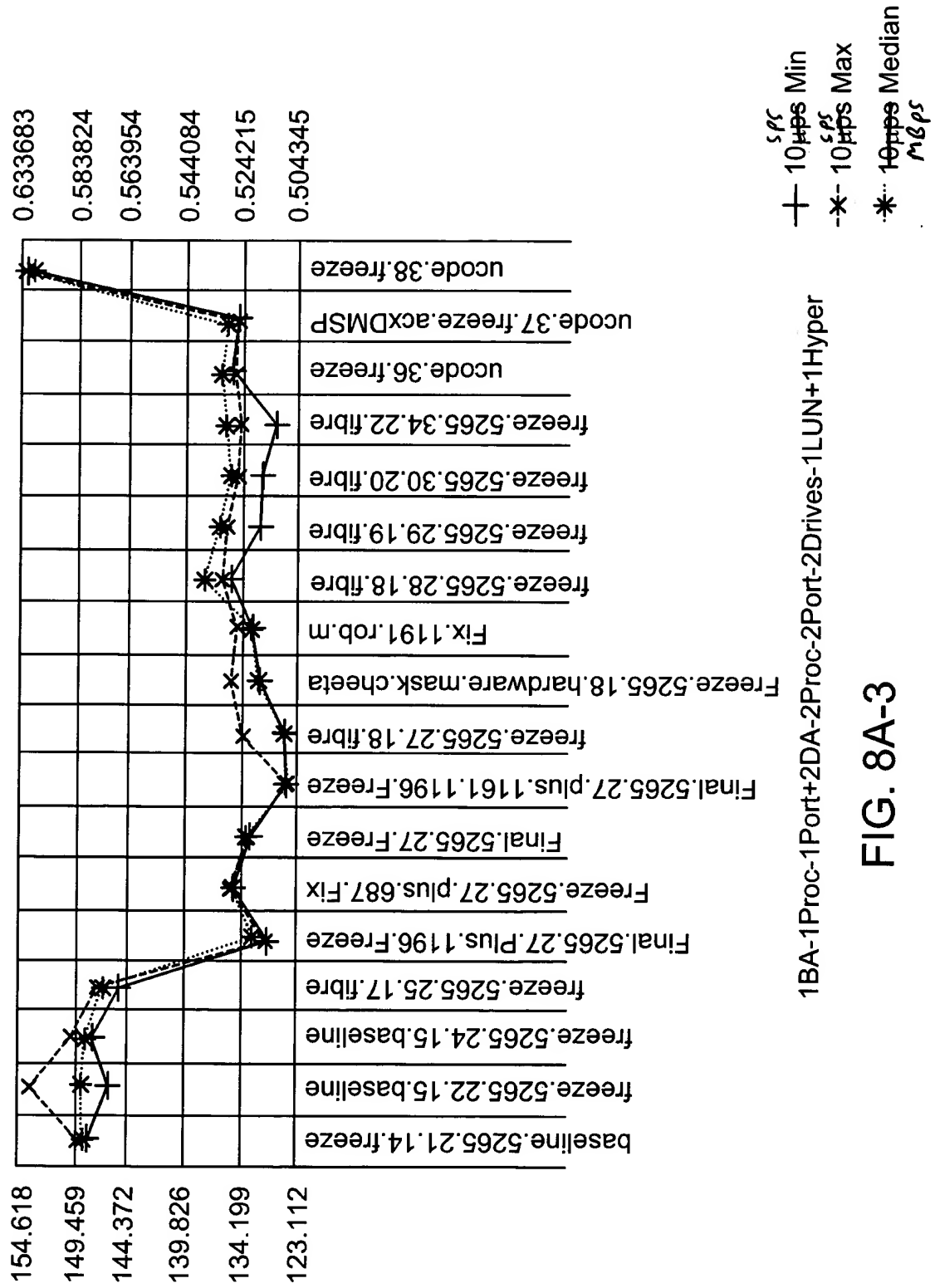
FIG. 8A-1

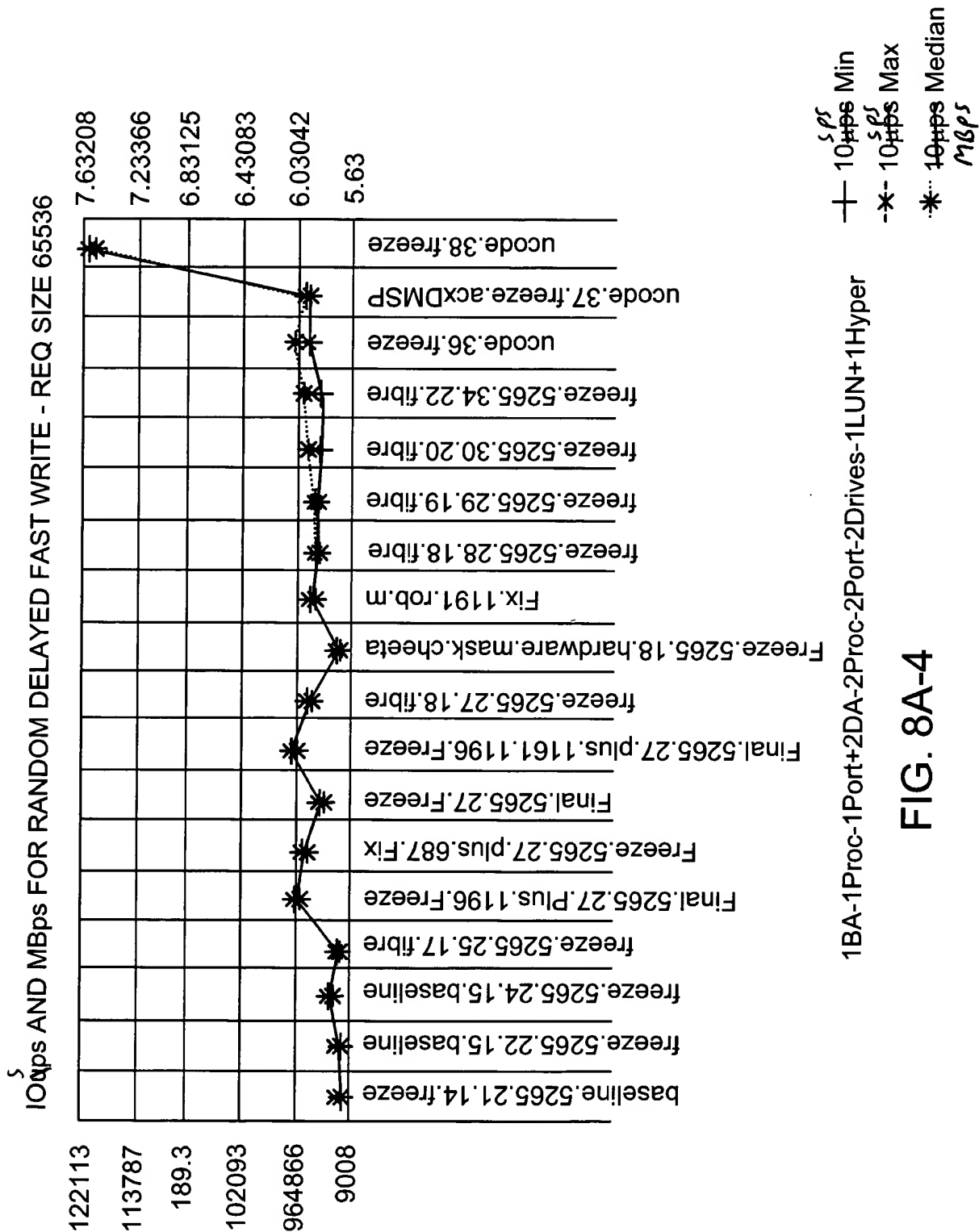
FIG. 8A-1	FIG. 8A-2
FIG. 8A-3	FIG. 8A-4

FIG. 8A



IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4896





IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512

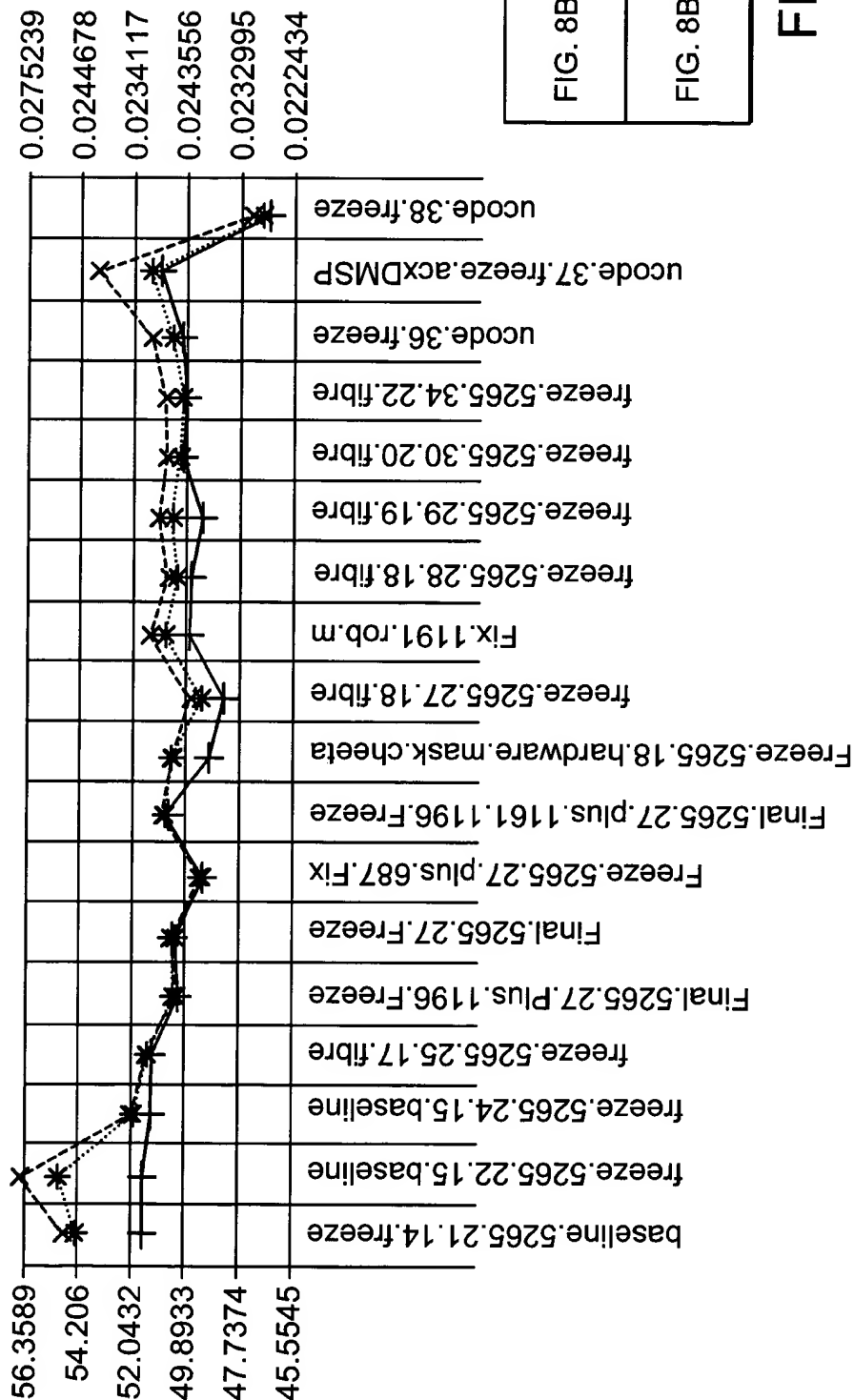
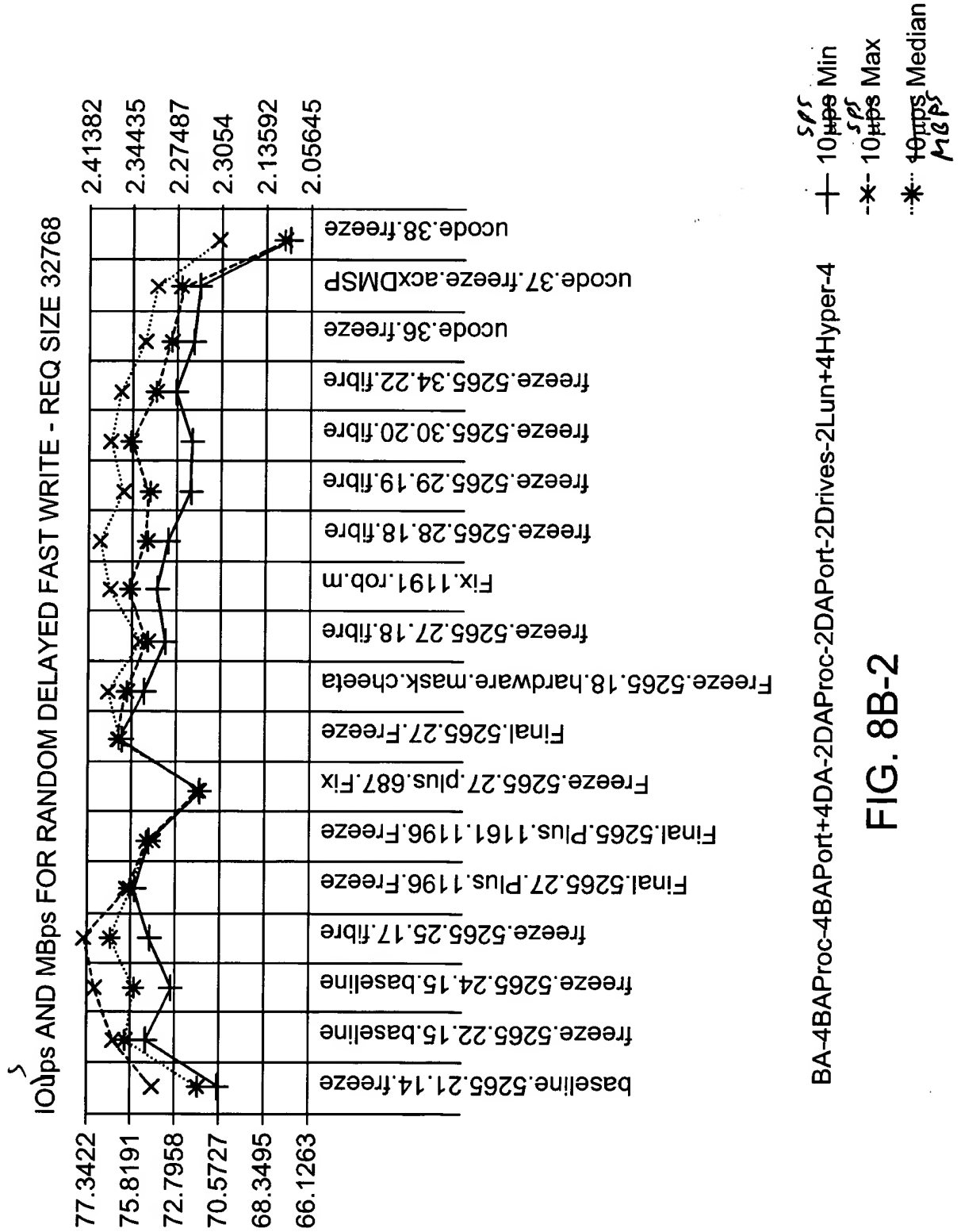


FIG. 8B-1	FIG. 8B-2
FIG. 8B-3	FIG. 8B-4

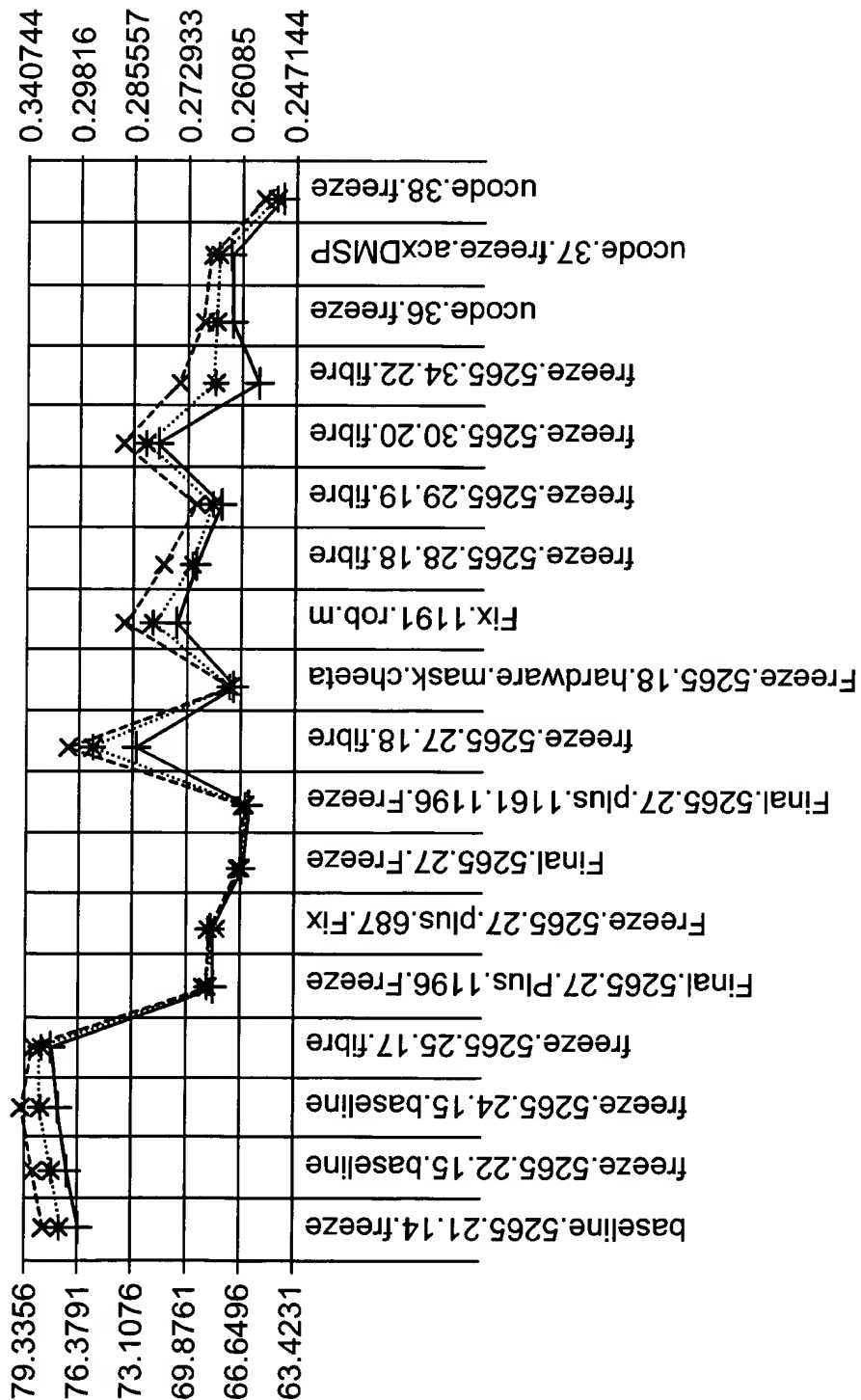
FIG. 8B

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4
 5ps
 + 10ps Min
 * 10ps Max
 * 10ps Median
 MBps

FIG. 8B-1



IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4096

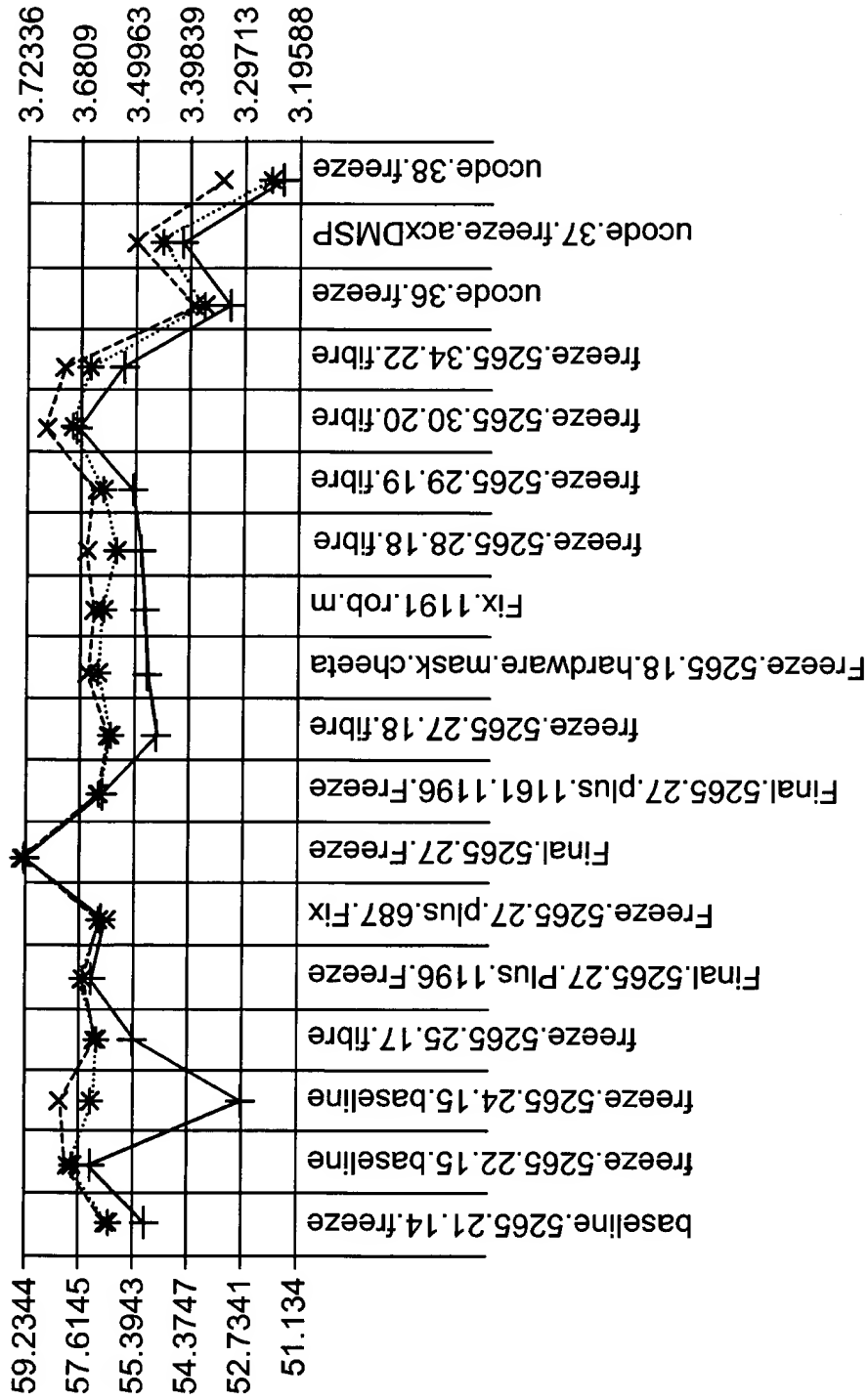


10µps Min
 10µps Max
 10µps Median
 10µps Avg

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-3

IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 65536



10MBps Min
10MBps Max
10MBps Median
10MBps

BA-4BAProc-4BAPort+4DA-2DAProc-2DAPort-2Drives-2Lun+4Hyper-4

FIG. 8B-4

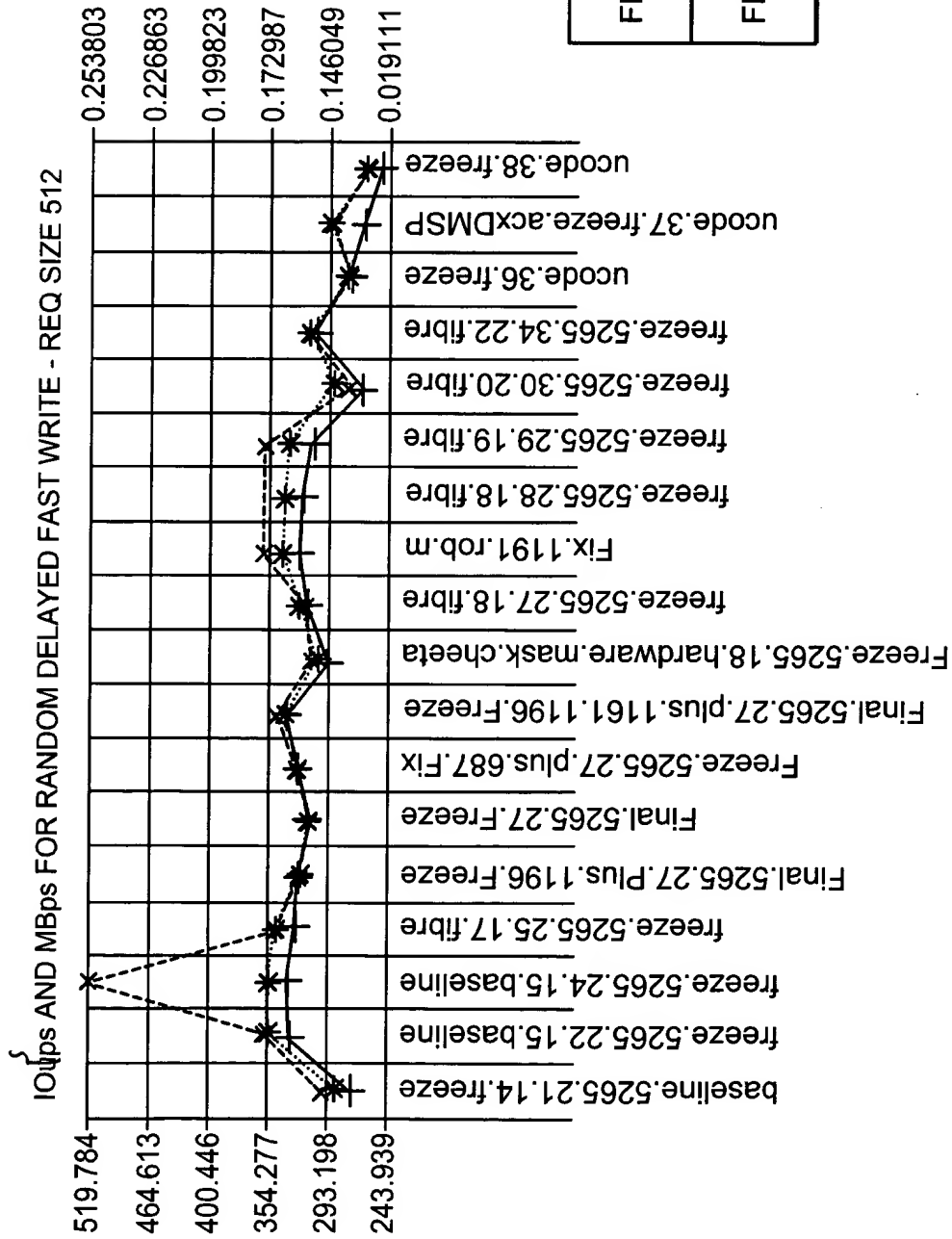


FIG. 8C-1	FIG. 8C-2
FIG. 8C-3	FIG. 8C-4

FIG. 8C

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4
 Sps
 + 10 Sps Min
 * 10 Sps Max
 * 40 Sps Median
 MBps

FIG. 8C-1

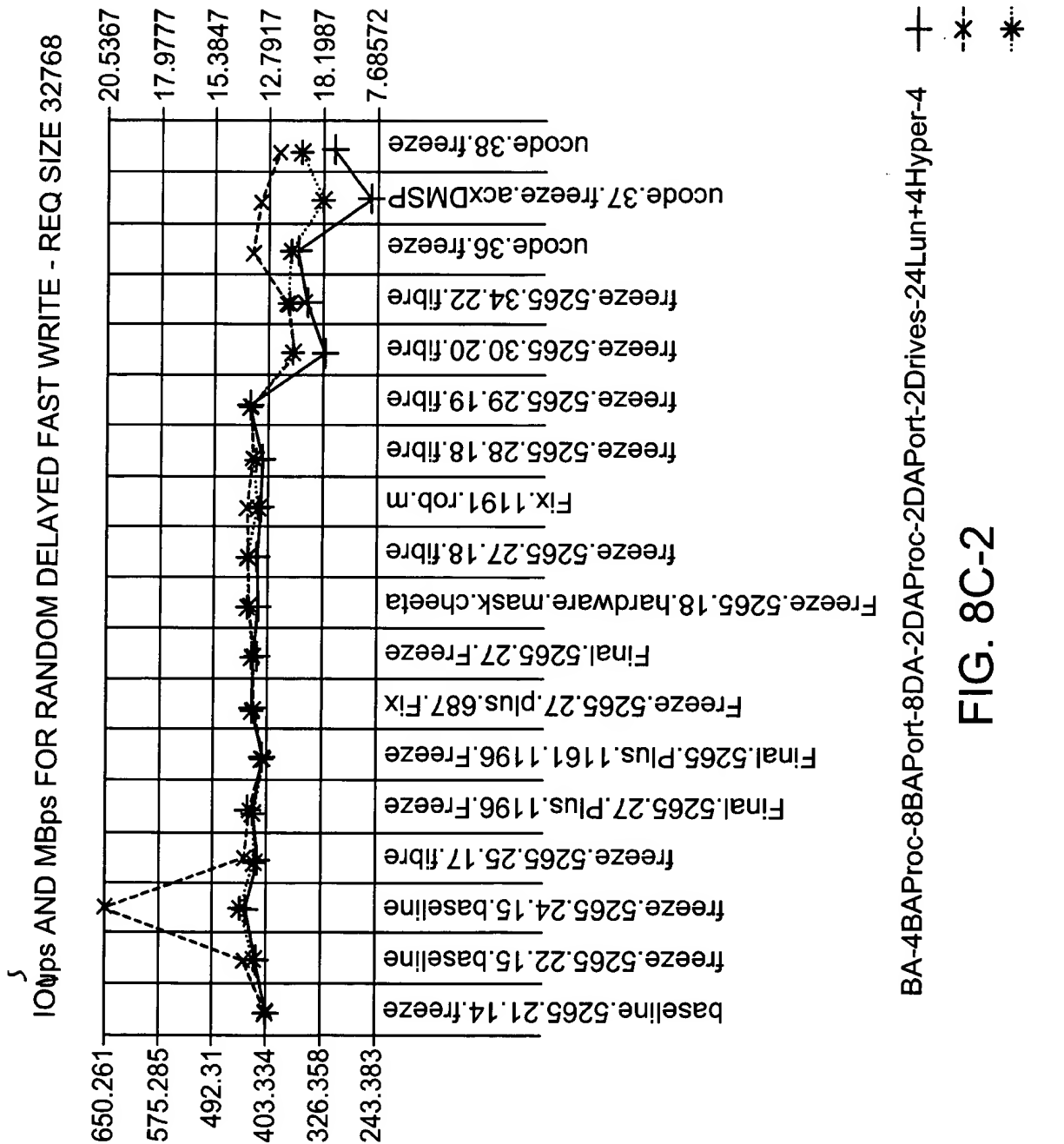
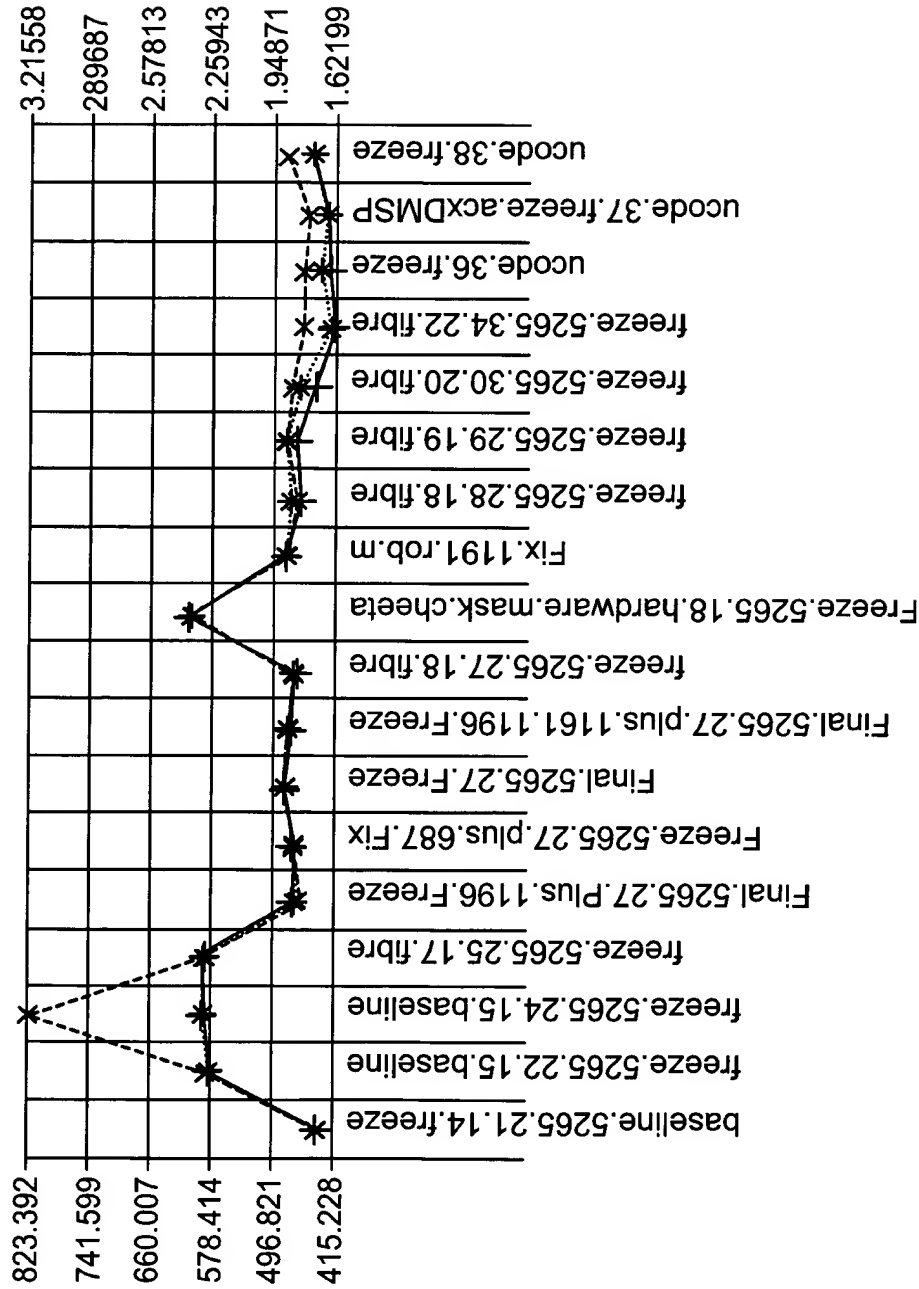


FIG. 8C-2

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 4896



BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

 + 10pps Min

 * 10pps Max

 * 10pps Median

 MBps

FIG. 8C-3

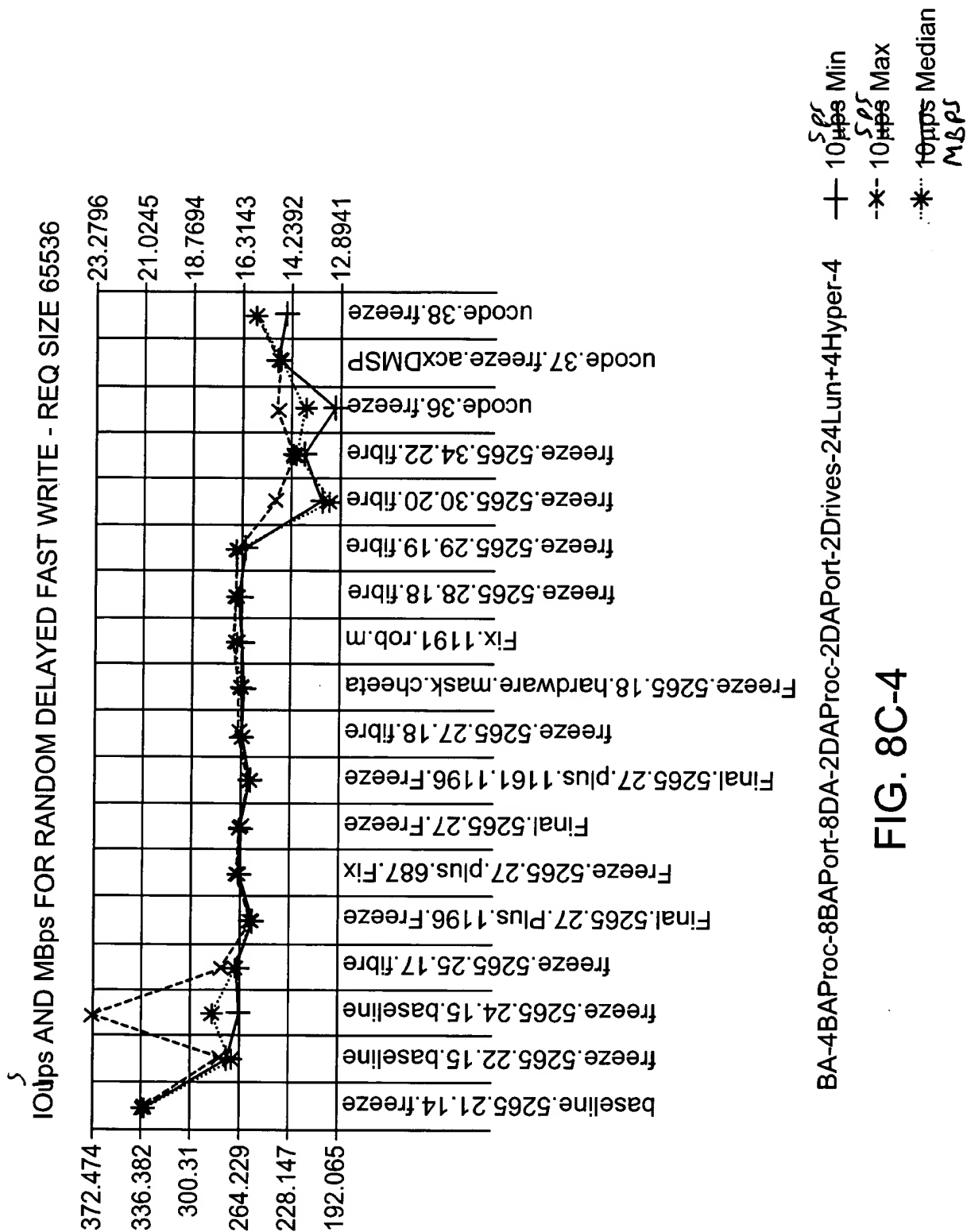
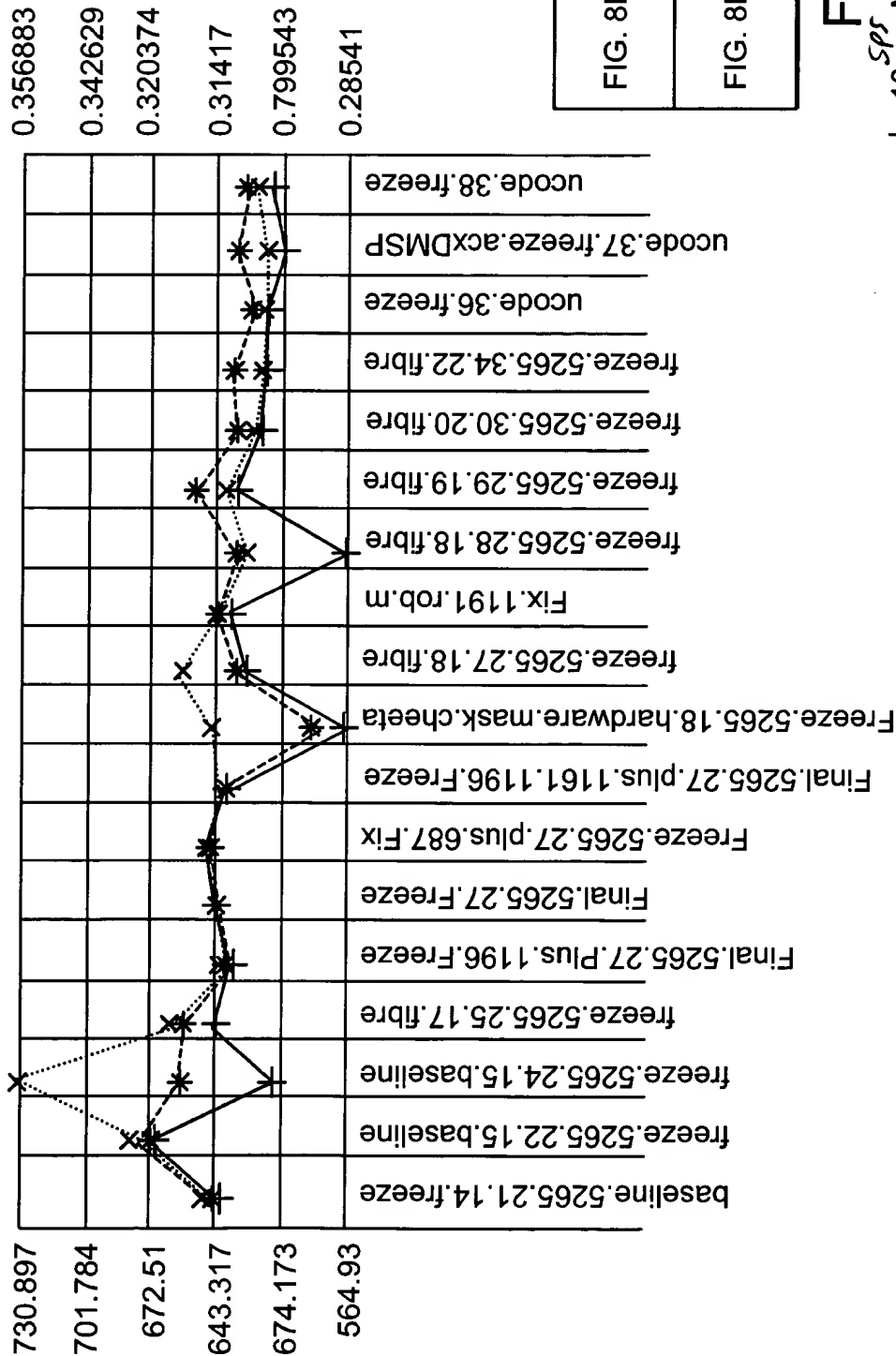


FIG. 8C-4

BA-4BAProc-8BAPort-8DA-2DAProc-2DAPort-2Drives-24Lun+4Hyper-4

IOps AND MBps FOR RANDOM DELAYED FAST WRITE - REQ SIZE 512



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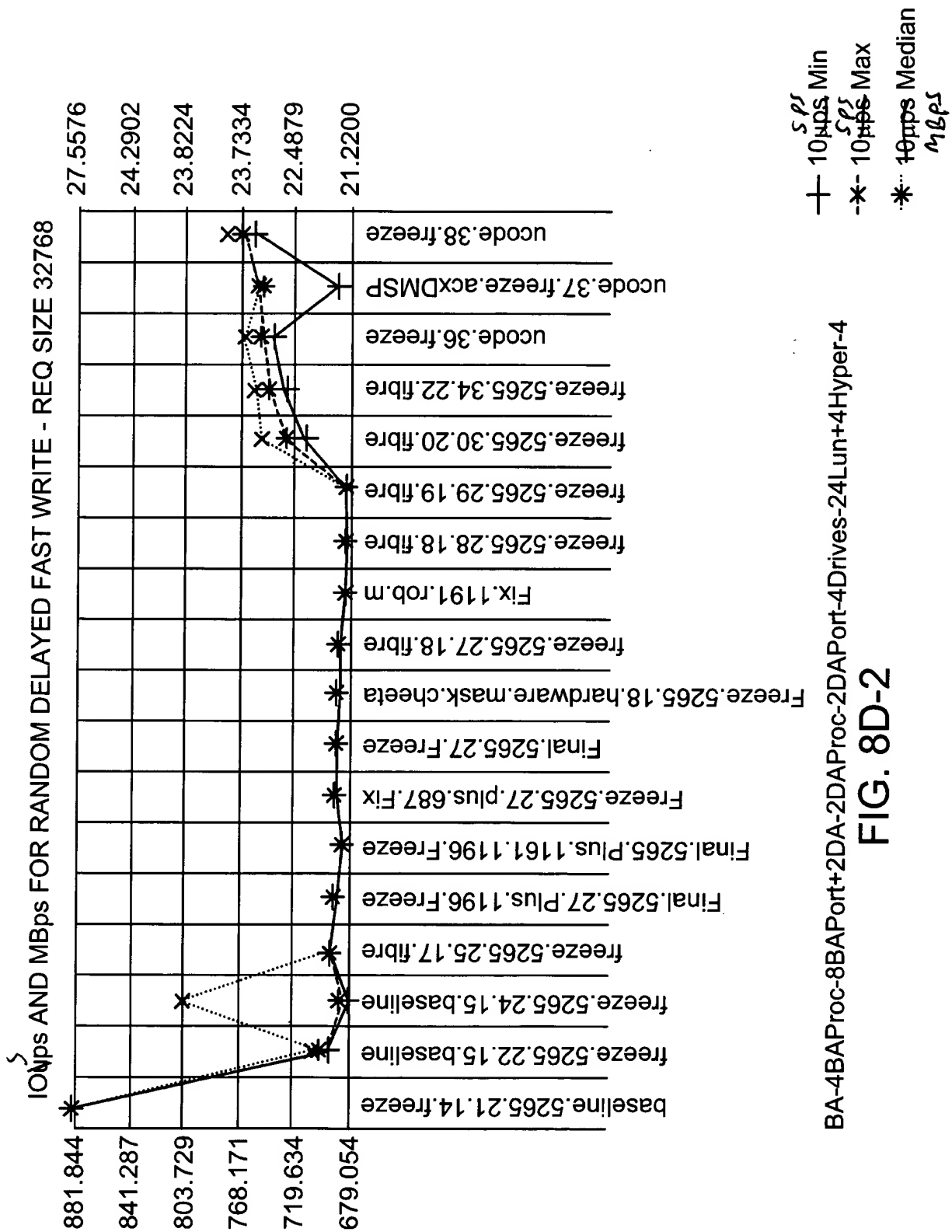
FIG. 8D-1	FIG. 8D-2
FIG. 8D-3	FIG. 8D-4

FIG. 8D

+ 10 Iops Min
 * 10 Iops Max
 * 10 Iops Median
 MBps

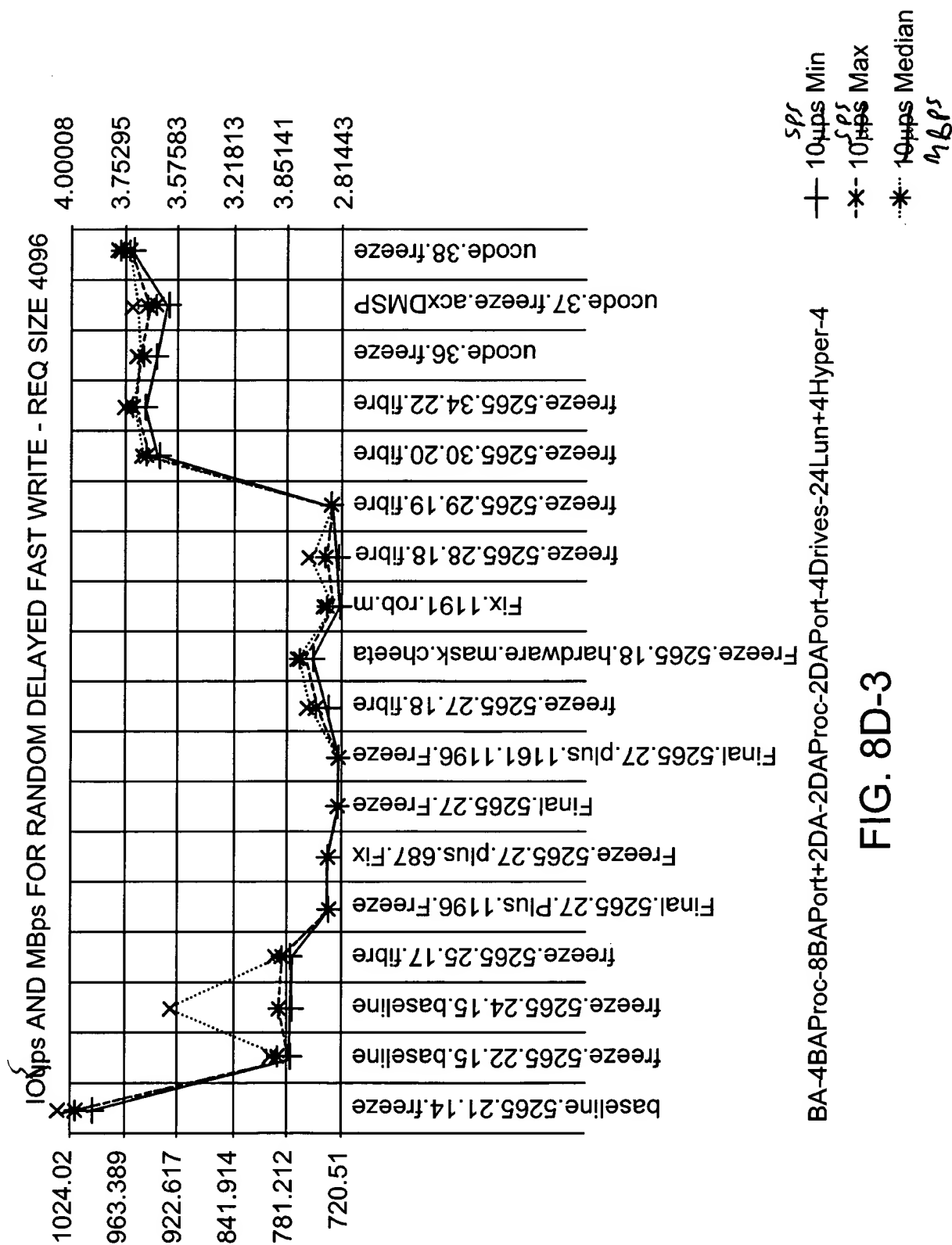
BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

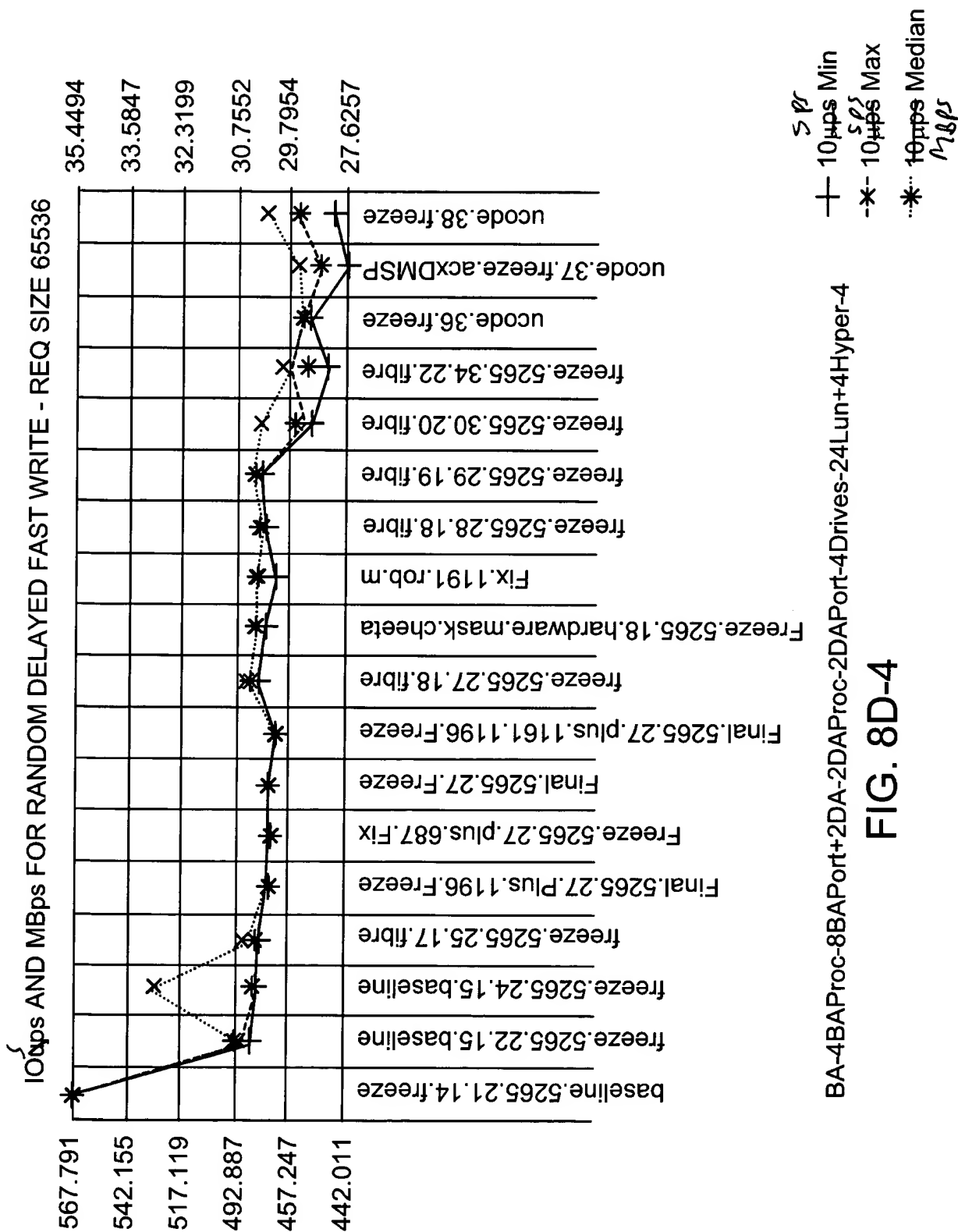
FIG. 8D-1



BA-4BAProc-8BAPort+2DA-2DAProc-2DAPort-4Drives-24Lun+4Hyper-4

FIG. 8D-2







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POST PROCESSING TAB
THE POST PROCESSING TAB CREATES OBJECTS, PLOT GRAPHS AND GENERATES SUMMARY
FILES USING THE Splus DATA ANALYSIS SOFTWARE.

Emc MarkNT

File Edit Project Log View Help

Project Test Phase Data Transfers Process Raw Data Post-Processing Reporting Database Lead

Post Processing

Characterization

Create Object

Update Object

Plot Graphs

View Graphs

Generate Summary

View Summary

Database Simulator

Create Object

Plot Graphs

View Graphs

Generate Summary

View Summary

Splus

Start SPlus

Close SPlus

View Style

☐ 2 Graphs/Page

☐ 8 Graphs/Page

☒ 12 Graphs/Page

☐ 15 Graphs/Page

MetaNT\Fibre.EmulexA 6/8/99 11:36 AM

FIG. 9



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DEVICE DETAIL

Device Details

Symmetrix

Vendor Id:

EMC

Product Id:

SYMMETRIX

Symmetrix Id:

000183500055

Director:

SA-16B

Port Number:

1

TID:

0

LUN:

0

Hyper Count:

2

Device Detail

Symmetrix Device:

000

Physical Device:

\\.\PHYSICALDRIVE0

Logical Device:

Serial Number:

55000321

Device Status:

Ready

Block Size:

512

Capacity:

7741440

Cylinders:

8064

Emulation:

FBA

Mirror Policy:

two-way mirror

Flags

☐ CKD

☒ META Head

☐ ASSOC

☐ META Member

☐ VCM

☐ Gatekeeper

☐ Mixed

☐ PowerPath Parent

☐ PowerPath Child

☐ PowerPath Sibling

☐ No channel

☐ RDF

☐ BCS

☐ BCV

☒ META

OK

FIG. 9B

SYMMETRIX DETAILS


Symmetrix			
Director Details			
Director:	FA-1A	Num Ports:	1
Director Type:	Fibre Adapter	Port 0 status:	On
Director Num:	1	Port 1 status:	N/A
Slot Num:	1	Port 2 status:	N/A
SCIS Width:	N/A	Port 3 status:	N/A
		OK	

FIG. 9C


Emc MarkNT Performance Characterization Workbench				
Symmetrix Configuration				
<input checked="" type="radio"/> Physical Device <input type="radio"/> Symmetrix Device				
cpq01 + 000183500055				
Hostname _____ cpq01 Add Remove Refresh				
Definition Environment Workload Configuration Benchmark Results Other				
Definition _____ Project _____ Project Name: Bison.Roland Test Phase: Full.Box.110199.Test Test Description: Storage Array _____ Storage Array: Symmetrix <input checked="" type="checkbox"/> Symmetrix 4.6 Model: 3830 Code: 5265 Serial # 000183500055 Code Date: 06231999 Details _____ Raid Type: Auto Hyper Policy: Auto Mirror Policy: Auto Cache Size: 8GB Physical Disks: 96 96 Disk Type: Auto				

FIG. 9D

ENVIRONMENT TAB



 Emc MarkNT Performance Characterization Workbench



File Actions View Help



Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

 cpq01

  000183500055

Hostname

Definition Environment Workload Configuration Benchmark Results

Environment

Master Host Directories

Tools Directory:

Work Directory:

Gateway:

Defaults

Maximum Block Size k

Block Sizes

☒ 512 ☐ 4096
☐ 1024 ☐ 8192
☐ 2048 ☐ 16384

Flags

DMSF

☒ Auto
☐ On
☐ Off
☐ Ignore

Trace

☒ Ignore
☐ Stop
☐ Clear
☐ CKD

☒ Flush Cache
☒ IMPL Reset (\$FDCE)

FIG. 9E

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device

☐ Symmetrix Device

cpq01

000183500055

Hostname

cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Workload Specification

Workload Execution List

50-50
DSS1
DSS2
OLTP1
OLTP2
OLTP3
OLTP4
PROGRESS
random_0read
random_100read
random_read_100hit
RRH
RRM

sequential
sequential
SR
TERADAT.
Testoltp1

View
New
Edit
Copy
Delete

Start

<< Add

Remove >>

☒ ALL ☐ User ☐ Std

FIG. 9F

Workload Execution

Workloads: OLTP1

Iterations: 1

Configuration Rule: 1BA-1Port/Proc

☐ Dry Run

OK Cancel

FIG. 9G

RESPONSE TIME WORKLOAD

☒ Edit Workload

Workload Description
Testoltp1

Delay

Cache Slots

Max I/O Second

Response Time

Throughput

1

15

Auto

☒ Response Time

☐ Throughput

Max Test Period

Min Test Period

Segment 1

Bucket Size

Max Sequential Count

210

0

1

30

50

Multiplier

LS seeks

Start Byte

Disk Extent

Min Sequential Count

1

0

0

0

50

OK

Cancel

Workload Transaction Definition

Size	%Workload	%Hits	%Random	%Read	Align	Align Back
OMB 4KB 0B	50	0	100	100	OMB 5KB 0B	OMB 0KB
OMB 4KB 0B	30	0	100	0	OMB 3KB 0B	OMB 0KB
OMB 4KB 0B	10	0	0	100	OMB 5KB 0B	OMB 0KB
OMB 4KB 0B	10	0	0	0	OMB 3KB 0B	OMB 0KB

Request Size

0

4

0

0

MBytes

KBytes

Bytes

Alignment

0

5

0

0

MBytes

KBytes

Bytes

Back Alignment

0

0

0

0

MBytes

KBytes

Bytes

Insert

Remove

% of Workload

0

50

100

% Cache Miss/Hit

100

0

0

% Sequential/Random

0

100

0

% Write/Read

0

100

0

FIG. 9H

THROUGHPUT WORKLOAD

View Workload

Workload Description

random_100read

Delay

1.0

Cache Slots

0

Duration Time

30

Unfrictd

0

Multiplier

4

LSeeks

0

SPlus Type

20000

RT Size

20000

RT Multiplier

4

I/O Loops

0

Start Byte

0

Random Range

0

Response Time

Throughput

OK

Cancel

☒ Collect Response Times

☐ Report Individual Response Times

Workload Transaction Definition

Size	% Workload	% Hits	% Random	% Read	Align	Align Back
0 MB 0KB 0B	100	0	100	100	0 MB 0KB 0B	0 MB 0KB

Request Size

0 MB 0KB 0B

Alignment

0 MB 0KB 0B

Back Alignment

0 MB 0KB 0B

Insert

Remove

% of Workload

100

% Cache Miss/Hit

100

% Sequential/Random

100

% Write/Read

0

FIG. 9I



Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

cpq01

+

.....

000183500055

Hostname

cpq01

Add

Remove

Refresh

Definition Environment Workload Configuration Benchmark Results Other

Configuration Rule Definition

All Configuration Rules

Rule	P/E Expression	B/E Expression	
1/2Hyper		[01]	View
1DA_Port		M	New
1Hyper		0:M	Edit
10dd1Evert_BA	(01:a:0[01:b:0)	:M	Copy
2Drives-3/4Hyper		[01]:[Delete
2Drives-3Hyper		[01]:[
2Drives-Not1Hyper		[02]:[
3/4Hyper		[012]	
3Drives		[012]:	
3Drives-1/2Hyper		[012]:	
3Drives-2Hyper		[012]:	
3Drives-3/4Hyper		[012]:	

☒ ALL ☐ User ☐ Std

FIG. 9J

Configuration Definition

Rule Name:

Rule Definition

F/E Expression: B/E Expression:
~Expression not yet Defined

F/E Expression:

B/E Expression:

Front-End

☒ FA-01:a:0 ☒ SA-16:a:0
☒ FA-05:a:0 ☒ SA-16:a:1
☒ FA-12:a:0 ☒ FA-01:a:0

Back-End

☒ DA-02:a:C ☒ DA-15:a:C
☒ DA-03:a:C ☒ DA-02:a:C
☒ DA-14:a:C ☒ DA-03:a:C

Expressions

Max I/O Second: Auto

Mirrors

☒ M1 ☐ M2

TIDs

☒ 0 ☐ 1

LUNs

☒ 0 ☒ 1 ☒ 2 ☒ 3

FIG. 9K

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

Physical Device ☒ Symmetrix Device

cpq01
..... 000183500055

Hostname
cpq01

Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Benchmark Definition

Benchmark Execution List

All Benchmarks

Profiling Regression

View New Edit Copy Delete

Start

ALL ☒ User ☐ Std

Remove >>

<< Add

FIG. 9L



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A screenshot of a software dialog box titled "Benchmark Execution". The dialog has a standard Windows-style title bar with minimize, maximize, and close buttons. Inside, there are two text input fields: "Benchmark" and "Regression". Below these fields, there is a label "Iterations:" followed by a text box containing the number "3" and a dropdown arrow button. To the right of the "Iterations:" section are two checkboxes: "Dry" (unchecked) and "Run" (checked). At the bottom right of the dialog are two buttons: "OK" and "Cancel".

FIG. 9M

View Benchmark

Benchmark Name

Regression

OK

Cancel

Benchmark Workload Definition

Workload	Configuration Rule	Delay Milliseconds	Cache Slots	Max IOPs
RRM	1Hyper	-1	-1	
RRM	Everything	-1	-1	
OLTP1	Everything	-1	-1	
OLTP2	3Hypers/4Drives	-1	-1	
OLTP3	1Hyper/2Drives	-1	-1	
DSS1	1Hyper	-1	-1	
DSS2	Everything	-1	-1	
TERADATA	2Drives/DA-3Hyper/4Drives	-1	-1	

Delay

0

Cache Slots

0

Max I/O Second

0

Bucket Size

0

Max Sequential Count

50

Max Test Period

0

Min Test Period

0

Segment 1

0

Segment 2

0

Min Sequential Count

50

Multiplier

0

LSeeks

0

Start Byte

0

Disk Extent

0

Configuration Rule

1 Hyper

Remove

Workload

RRM

Insert

Emc MarkNT Performance Characterization Workbench

File Actions View Help

Symmetrix Configuration

☒ Physical Device ☐ Symmetrix Device

cpq01
+ 000183500055

Hostname
cpq01
Add Remove Refresh

Definition Environment Workload Configuration Benchmark Results

Results Display

Reports

☒ Runtime
☐ Nohup
☐ Exceptions
☐ DB Summary

View

FIG. 90

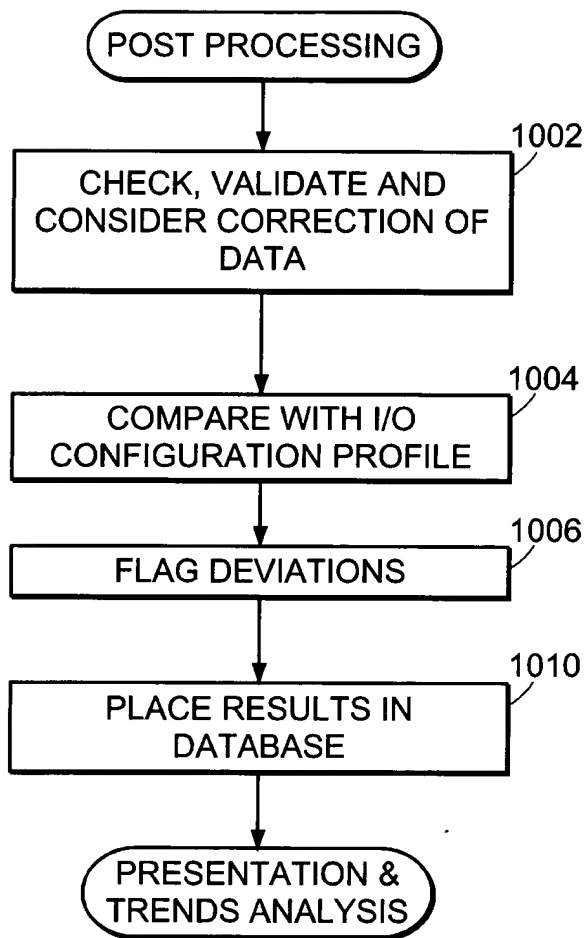


FIG. 10





   

Table Variables

Row	config
Column	req size
Configuration	test type
Test Description	none

Summary Functions

IO Function	max
MB Function	max


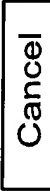




 

FIG. 10A

Advanced Database Simulator Summary

Table Variables

Row	test type
Configuration	config
Column	interval

Summary Functions

IO Function	max
MB Function	min


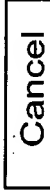
 

FIG. 10B

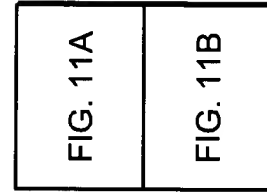


FIG. 11

FILE DESCRIPTIONS

FILE NAME	DESCRIPTION	HIGHLIGHTS
Char.Summary	SUMMARY FILE OF EACH CHARACTERIZATION TEST BROKEN DOWN BY ITERATION, TEST TYPE, AND CONFIGURATION	
Char.Splus	DATA FILE FEED TO Splus TO CREATE CHARACTERIZATION OBJECTS	
Char.Errors	CHARACTERIZATION ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES.	MESSAGE APPEARS IF ERROR FILE EXISTS
SX.Summary	SX SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX.Splus	DATA FILE FEED TO Splus: USED WITH Char.Summary FILE TO CREATE CHARACTERIZATION OBJECTS	
SX.Errors	SX ERRORS FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS

FIG. 11A

DB.Table	SUMMARY FILE OF EACH DB SIMULATOR TEST BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
DB.Splus	DATA FILE FEED TO Splus TO CREATE DBSimulator OBJECTS	
DB.Errors	DB SIMULATOR ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS
SX_DB.Summary	SX DB SUMMARY DATA BROKEN DOWN BY ITERATION, TEST TYPE AND CONFIGURATION	
SX_DB.Splus	DATA FILE FEED TO Splus. USED WITH DB.Splus FILE TO CREATE DBSimulator OBJECTS	
SX_DB.Errors	SX_DB ERRORS PRODUCED FROM PROCESSING THE RAW DATA FILES	MESSAGE APPEARS IF ERROR FILE EXISTS
Cache Ratio Report	REPORT TRACKING THE CACHE RATIO FROM THE SYM AND THE PROCESSED DATA	REPORT NAME: "CacheRatioReport.txt" LOCATED IN THE RAW DATA FOLDER MESSAGE APPEARS IF A REPORT

FIG. 11B

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